

and Middle Plateau, 2 to 3; Southern Plateau, 0 to 1; California, 0 to 3; coast of Oregon and Washington Ty., 6 to 11.

Hail—But few hail-storms have been reported during the month. The only stations reporting more than one storm are: Pikes Peak, 6; Summit, Col., 7; De Soto and Omaha, Neb., 3. Two states report two separate storms in one day, on the 12th at Ames and Monticello, Iowa; 23rd Bellefontaine and Jacksonburg, Ohio. Hail fell 1st, at Cincinnati and Buffalo; 2nd, Chicago; 6th, Georgetown, Col., Kansas City, Mo., and Wellington, Kan.; 12th, Milwaukee, "large enough to kill fowls;" 13th, Lawrence, Kan.; 14th, Yankton, Dak.; 16th, Chambersburg, Pa.; 21st, Wilsonville, Ala.; 22nd, Mt. Washington; 23rd, Corvuing, Mo., and Freehold, N. J.; 28th, Ft. Keogh, Montana, large size and doing much damage. No hail was reported west of the Rocky Mountains.

Snow—Red Bluff, Cal., 21st, on coast range; on the summit of Pike's Peak, 4th to 6th, 7th, 12th, 13th, 15th, 16th, 19th to 21st, 28th and 29th; Virginia City, 29th, on mountains near; Summit, Col., 13th, 16th, 28th; Carson City, Nev., 28th, on mountains near; Burlington, Vt., 17th, on mountains near, two inches; Mt. Bridger, near Ft. Ellis, Montana.

Droughts—Throughout the month droughts were reported as existing in Utah, the Lower Missouri valley, the Upper Mississippi valley, northeastern part of Pennsylvania, and southeastern Michigan. Droughts commencing late in the month continued on the 31st in eastern Wisconsin, northeastern Illinois and Indiana. The droughts reported as prevailing in Nevada and Texas at the end of July ended in Nevada, excepting in the Humboldt valley, on the 1st of August; in Texas from the 9th to the 12th, except in Navarro county, where creeks and tanks were reported dry and stock suffering dreadfully at the end of August. On Carson river, Nevada, all mills were reported shut down on 22nd, for lack of water.

Floods and Water-spouts—3rd, near Milton, Pa., on the west branch of the Susquehanna; 11th, water-spout at entrance to Pensacola Bay, at 11.20 a. m., course from southwest to northeast; 16th, Mayport, Fla., moved over the sea from southwest to northeast for about four miles, and then broke; 12th to 14th, high water in the Rio Grande river overflowing the valley between Rio Grande City and Brownsville, doing considerable damage.

RELATIVE HUMIDITY.

The percentages of mean Relative Humidity for the month range as follows: New England, 65 to 87; Middle Atlantic States, 71 to 83; South Atlantic States, 69 to 84; Gulf States, 69 to 85; Ohio valley and Tennessee, 62 to 77; Lower Lakes, 64 to 72; Upper Lakes, 63 to 70; Upper Mississippi valley, 61 to 68; Lower Missouri valley, 60 to 65; Red River of the North valley, 63 to 76; Rocky Mountain Slope, 49 to 66; Plateau districts, 22 to 70; California, 31 to 78; Oregon, 33 to 59. *High stations* report the following averages, not corrected for altitude: Mt. Washington, 83.9; Pike's Peak, 52.3.

WINDS.

The prevailing winds, at the Signal Corps stations, are shown by the arrows flying with the wind on chart No. II. The *maxima velocities* per hour have been given in the descriptions of movements of areas of low pressure.

Total movements of the air—The following were the *largest* monthly movements in miles recorded at the Signal Corps stations: Mt. Washington, 18,638; Cape Lookout, 12,656; Portsmouth, N. C., 11,954; Kittyhawk, 18,982; Cape Hatteras, 10,501; Pikes Peak, 10,470; Sandy Hook, 9,613; Cape May, 9,406; Barnegat, 9,213; Dodge City, 8,661; Indianola, 8,554; San Francisco, 8,264; North Platte, 8,111. The smallest movements were: Silver City, N. M., 848; La Mesilla, 1,148; Fredericksburg, Texas, 1,818; Nashville, 1,920; Graham, 1,928; Lynchburg, 2,019; Tucson, 2,051; Roseburg, 2,144; Deadwood, 2,254; El Paso, 2,322; Visalia, 2,374.

Local Storms—On the 3rd a heavy wind storm at Phoenix, Arizona. 14th, heavy storm at Portland, Maine, blowing down houses, uprooting trees &c., in the adjoining country. From the 17th to the 19th a series of violent storms were reported along the Atlantic coast from South Carolina to Maine in connection with the cyclone which then passed along the coast. 22nd, Biloxi, Miss., whirlwind about one hundred feet wide passed through the centre of the Sea Shore Camp Grounds, demolishing five cabins and taking off a portion of the roof of the tabernacle, scattering it some three hundred feet. Large oak trees were lifted out by the roots and in some instances broken off short. One person fatally and one seriously injured. On the 28th, at 4.20 p. m. a violent gale from the northwest occurred at Fort Keogh, Montana. The wind attained a velocity of 52 miles at 4.45 p. m., and was accompanied by heavy rain and large hailstones, the latter doing much injury. Several buildings were seriously damaged. The storm lasted 35 minutes.

VERIFICATIONS.

Indications—The detailed comparison of the tri-daily weather indications for June with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 2.44 per cent, and of verifications to be 84.0 per cent. The percentages for the four elements have been, Weather, 92.4; Direction of the Wind, 84.1; Temperature, 83.6; Barometer, 74.7. The percentages of verifications by geograph-

ical districts have been: New England, 85.9; Middle States, 86.6; South Atlantic States, 81.9; East Gulf States, 85.0; West Gulf States, 84.7; Lower Lake region, 85.8; Upper Lake region, 82.6; Tennessee and the Ohio valley, 84.5; Upper Mississippi valley, 81.0; Lower Missouri valley, 80.3; Northern Pacific coast region, 85.8; Central Pacific coast region, 95.7; Southern Pacific coast region, 100. Of the 3,720 predictions that have been made, 162, or 4.4 per cent, are considered to have entirely failed; 131, or 3.5 per cent, were one-fourth verified; 484, or 13.0 per cent, were one-half verified; 360, or 9.7 per cent, were three-fourths verified; 2,583, or 69.4 per cent, were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary Signals.—87 Cautionary Signals were displayed during the month, of which 73, or 83.9 per cent., were justified. 13 Cautionary Off-shore Signals were displayed, which were all fully justified both as to direction and velocity. 75 cases of winds of over 25 miles per hour were reported, when signals were not ordered. The above does not include signals ordered at 47 display stations where the velocity is only estimated and not measured.

NAVIGATION.

In the table, on the right-hand side of chart No. III, are given the highest and lowest readings on the Signal Corps river-gauges for the month, with the dates. The rivers in general remained quite low and falling throughout the month and in no case did the water reach the danger-line. The only important freshets were those following the heavy rains attending storm-area No. IX, in the Red, Arkansas, and Lower Ohio rivers. On the 23rd the water in the Upper Mississippi was so low as to interfere with navigation north of La Crosse.

High Tides.—15th, Toledo highest of the season, very near the highest point ever known; 17th, Cape Lookout; 18th, Macon and Portsmouth, N. C., and Cape May and Atlantic City N. J.; 21st, Galveston; 28th, Mayport, Fla.; 31st, Indianola, Texas.

Low Tides.—1st to 3rd, Indianola, Texas.

Tidal Waves.—18th, at Fisk's Mills, Sonoma county, Cal.; four persons drowned.

TEMPERATURE OF WATER.

The *temperatures of water*, as observed in rivers and harbors, with average depth at which the observations were taken, are given on chart No. II. No observations were taken during the month at San Francisco owing to the breakage of the thermometer. At Milwaukee the minimum temperature for the month is omitted as the reports for several days during the month indicated that the thermometer was out of order. The following reports were received too late to be incorporated in the regular table: Punta Rassa maximum temperature at bottom 91°, minimum temperature at bottom 79°, average depth of water 12.3 feet.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—Thunder storms have been reported in too large numbers during the past month to permit their enumeration in detail. They have been reported on the greatest number of days, in the following states, viz: Iowa 17; Ohio and North Carolina, 14; Illinois, 13; Indiana, Massachusetts and New Jersey, 10; Florida and Nebraska, 9; Summit, Col., (elevation 11,300) reported such storms on 14 days; Pikes Peak on only 3 days. On 5th, 6th, 14th and 22nd they were frequent in the Ohio Valley; on 16th, 17th, 21st and 22nd in the Middle and South Atlantic States; on 22nd and 29th, in New England; on the 10th, 11th and 12th in the Upper Mississippi and Lower Missouri Valleys; on the 14th, thunder-storms generally in New England and at isolated stations in New York, New Jersey, Pennsylvania, Ohio and Indiana. But two such storms have been reported west of the main range of the Rocky Mountains, at Phoenix and Tucson, Arizona.

Auroras.—Five auroras have been reported during the month; that of the night of 1st and 2nd was noticed at Burlington, Vt., where it appeared as a well defined dark segment of an emerald green; that of the 6th was seen at New Corydon, Ind., at 9 p. m., at Oregon, Mo., dark to 10 p. m., diffused light, and at Urbana, Ohio, from 6 p. m., as reddish light, becoming white at 9 p. m., and ending at 9:30 p. m.; that of the 9th was observable from Burlington, Vt., on the east to Alpena, Breckenridge and Bismarck on the west. At Breckenridge at 9:55 p. m., bluish colored streamers shot out along the whole length of the lower arch and extended from one to ten degrees along the upper arch; at 10 p. m. only a faint light remained; that of the 7th at Oregon, Mo., from dark to 10 p. m., no streamers; that of the 23rd was observed at Newburyport, Mass., where it was quite faint, and at Gardiner, Me., at which place it was visible from 10 p. m. to midnight; also at Alpena, Mich.

Atmospheric Electricity Interfering with Telegraphic Communications.—Pembena, 1st and 24th; Phoenix Ariz., 3rd; in Texas, at Eagle Pass, 3rd, 4th, 7th, 15th and 19th; at Brackettville, 4th and 6th; at Graham and Jacksboro on the 7th; Castroville, 6th, 7th and 15th; Rio Grande City, 8th; Brownsville, 15th; Mason, 17th; Fort Sill, 6th; Santa Fé, 5th, 6th, 9th, 13th, 14th, 16th, 18th; Pike's Peak, 12th, remarkable display; Macon, N. C., 8th.

Magnetic Variation.—Prof. F. Hess reports the variation of the magnetic needle on the 9th, about 10 p. m., in the San Juan Valley, Colorado, as "14° 34'."